

Claims:

1. Machining station wherein for machining of at least one workpiece (2) at least one machining unit (3), in particular a tool spindle (30) carrying a tool, is provided and the workpiece (2) is conveyed to a discharge point (60) and is picked up there by at least one workpiece carriage (4), **characterised in that** the workpiece carriage (4) conveys the workpiece (2) to the machining unit (3) for a machining as well as moves it through the machining unit (3) during the machining, the workpiece being movable by the workpiece carriage (4) along only one linear axis (Y).
2. Machining station according to claim 1, **characterised in that** the tool spindle (30) is movable relatively to the workpiece carriage (4) along two to the direction of movement of the workpiece carriage (4) along the first linear axis each rectangular arranged second (X) and third (Z) linear axis.
3. Machining station according to claim 1, **characterised in that** the discharge point (60) is located within the machining station, respectively the working area.
4. Machining station according to claim 1, **characterised in that** the workpiece carriage (4) is able to rotate the workpiece (2) around a rotational axis (A, B, C).
5. Machining station according to claim 1, **characterised in that** the workpiece carriage (4) carries several workpieces (2).
6. Machining station according to claim 1, **characterised in that** the workpiece carriage (4) is guided in a stand (10) or in a tower (100).
7. Machining station according to claim 1, **characterised in that** the workpiece carriage (4) moves essentially vertically (Y).
8. Machining station according to claim 1, **characterised in that** the workpiece (2) is clamped on a workpiece carrier (5).
9. Machining station according to claim 1, **characterised in that** the workpiece (2) is clamped on a workpiece carrier (5) upright, suspended, lateral or inclined.

10. Machining station according to claim 1, **characterised in that** the workpiece carriage (4) grasps and holds the workpiece (2), respectively the workpiece carrier (5) which carries the workpiece, from above, inclined from the side and/or from below.
11. Machining station according to claim 1, **characterised in that** the workpiece carriage (4) is designed like a frame or a rocker.
12. Machining station according to claim 1, **characterised in that** the workpiece carriage (4) is designed like a table, and the workpiece (2) is supported by the workpiece table (45) of the workpiece carriage (4).
13. Machining station according to claim 1, **characterised in that** the workpiece carriage (4) can rotate the workpiece (2) around at least one rotational axis (A, B, C), and the rotational axis is rectangular (A, C), parallel (B) or angular (CB) to the vertical direction of movement (Y) of the workpiece carriage (4).
14. Machining station according to claim 1, **characterised in that** a hinged bearing (42), in particular around the rotational axis (A), respectively around a horizontal axis, is provided on the workpiece carriage (4).
15. Machining station according to claim 1, **characterised in that** several workpieces (2) which are positioned on the workpiece carriage (4) can be rotated around a common horizontal axis (A).
16. Machining station according to claim 1, **characterised in that** the workpiece carriage (4) can rotate the workpiece (2) around two or three axis (A, B, C) which are each directed rectangular to each other.
17. Machining station according to claim 1, **characterised in that** on the workpiece carriage (4) at least one, preferably two, lateral cheeks (43) are provided which rotatably carry a carrier (46), and the carrier (46) holds the workpiece (2) or the workpiece carrier (5).
18. Machining station according to claim 1, **characterised in that** the workpiece (2) or the workpiece carrier (5) is held by a carrousel (47) which is supported rotatably on a carrier (46), and the carrier is arranged at the workpiece carriage.
19. Machining station according to claim 1, **characterised in that** at least one, preferably two, lateral cheeks (43)

are provided at the workpiece carriage (4) and the lateral cheeks (43) hold a hinged bearing (42).

20. Machining center according to claim 1, **characterised in that** the workpiece (2) or the workpiece carrier (5) is held by a carrousel (47) which is supported rotatably on a carrier (46) and the carrier is arranged on the workpiece carriage and the carrousel (47) can be turned preferably around the B-axis, in particular around a vertical axis.
21. Machining center according to claim 1, **characterised in that** for each workpiece (2) carried by the workpiece carriage (4) a single, in particular also formed each by single carrousels, preferably vertically orientated rotational axis (B) is provided.
22. Machining station according to claim 1, **characterised in that** the workpiece carriage (4) is guided in a frame (11).
23. Machining station according to claim 1, **characterised in that** the workpiece carriage (4) is guided in such a way that a machining from two sides, in particular from both sides with regard to the conveying line (6) is carried out.
24. Machining station according to claim 1, **characterised in that** the workpiece carriage (4) is guided in a stand (10) and the stand (10) for the guide of the workpiece carriage (4) is arranged in the region of the discharge point (60) on the side opposite the machining unit (3).
25. Machining station according to claim 1, **characterised in that** the workpiece carriage (4) is guided in a frame (11) and the frame (11) extends, respectively is supported, in the region of the discharge point (60) on both sides of the discharge point (60).
26. Machining station according to claim 1, **characterised in that** the workpiece carriage is guided in a stand (10) or a frame (11) and the vertically orientated stand parts, respectively frame parts (12), have guide rails (15) on which at least one each, preferably two each, guide shoes of the workpiece carriage (4) move.
27. Machining station according to claim 1, **characterised in that** the workpiece carriage (4) moves also horizontally, preferably rectangular, to the spindle axis (31).
28. Machining station according to claim 1, **characterised in that** the workpiece (2) is moved along a conveying line

(6) and the discharge point (60) is part of this conveying line (6), respectively the conveying line (6) is connected to the discharge point (60).

29. Machining station according to claim 1, **characterised in that** on the machining station a first discharge point (66) for the feeding and a second discharge point (67), distant from the first one, for the removing of the workpieces (2) is provided.
30. Machining station according to claim 1, **characterised in that** the machining unit (3) has conveying means (62) for the movement of the workpiece (2), respectively of the workpiece carrier (5), on the conveying line (6) at least in the region of the machining station (1).
31. Machining station according to claim 1, **characterised in that**, the machining unit (3) has conveying means (62) for the movement of the workpiece (2), respectively the workpiece carrier (5,) on the conveying line (6) at least in the region of the machining station (1), and the conveying means (62) feeds a workpiece (2), respectively a workpiece carrier (5), waiting in front of the machining station on the conveying line (6) into the machining station.
32. Machining station according to claim 1, **characterised in that** the machining unit (3) has conveying means (62) for the movement of the workpiece (2), respectively the workpiece carrier (5), on the conveying line (6) at least in the region of the machining station (1) and the conveying means (62) conveys finished workpieces (2) to the conveying line positioned in flow direction behind the machining station.
33. Machining station according to claim 1, **characterised in that** the machining unit (3) can essentially be moved and positioned rectangular to the movement of the workpiece carriage (4).
34. Machining station according to claim 1, **characterised in that** the machining unit (3) carries one or more tool spindles (30).
35. Machining station according to claim 1, **characterised in that** the machining station has several machining units (3).
36. Machining station according to claim 1, **characterised in that** the workpiece (2) is positioned between two machining units (3) of the machining station during the machining.

37. Machining station according to claim 1, **characterised in that** the workpiece carriage (4) is able to turn the workpiece (2) around at least one rotational axis (A, B, C) and the rotational axis (A) is, on the one hand, rectangular to the spindle axis (31) and, on the other hand, is rectangular to the direction of movement (Y) of the workpiece carriage (4).
38. Machining station according to claim 1, **characterised in that** the workpiece carriage (4) carries a tool magazine (32) for the machining unit (3) and the workpiece carriage (4) can be positioned correspondingly for a change of tools on the machining unit (3).
39. Machining station according to claim 1, **characterised in that** independently from the movement of the workpiece carriage also a tool magazine can be moved and positioned.
40. Machining station according to claim 1, **characterised in that** a clamping device (50) is provided in order to connect the workpiece (2), respectively the workpiece carrier (5) carrying the workpiece (2), with the workpiece carriage (4).
41. Machining station according to claim 1, **characterised in that** the relative motion (Y) of the workpiece carriage (4) serves for grasping, respectively releasing, the workpiece (2), respectively the workpiece carrier (5), from the workpiece carriage (4).
42. Machining unit according to claim 1, **characterised in that** a clamping device on the workpiece carriage (4) is formed by a gripper (500) which can lifted and lowered, and that for lifting and lowering the gripper (500) an eccentric drive (503) is provided which moves together with the workpiece carriage (4).
43. Machining unit according to claim 1, **characterised in that** on the workpiece carriage (4) a hinged bearing (42) is provided, in particular around the rotational axis (A), respectively around a horizontal axis, and that a counterweight (8) is provided on the hinged bearing (42).
44. Machining station according to claim 1, **characterised in that** on the workpiece carriage (4) a hinged bearing (42), in particular around the rotational axis (A), respectively around a horizontal axis, is provided, and that a counterweight (8) is provided on the hinged bearing (42), and that the counterweight is formed by a

working cylinder which acts on a crank of a carrier (46).

45. Machining station according to claim 1, **characterised in that** the machining station (1) has two towers (100, 101) for the movement of the workpiece (2), that each tower carries a movable workpiece carriage and the workpiece carriages, if necessary together, carry at least one workpiece.

46. Machining station according to claim 1, **characterised in that** the machining station (1) has two towers (100, 101) for the movement of the workpiece (2), that each tower carries a movable workpiece carriage and the workpiece carriages, if necessary together, carry at least one workpiece and that one tower (100, 101) each is arranged on one side each of the conveying way.

47. Machining station according to claim 1, **characterised in that** the machining station (1) has two towers (103, 104) for the movement of the workpiece (2), that the towers (103, 104) are arranged one behind the other in direction of conveying of the workpieces (2) and that each tower (103, 104) is supported on both sides of the conveying line (6); each tower (103, 104) having an opening (105) for the conveying line for that purpose.

48. Machining station according to claim 1, **characterised in that** the machining station (1) has two towers (100, 101) for the movement of the workpiece (2), each tower carries a movable workpiece carriage and the workpiece carriages, if necessary together, carry at least one workpiece and the discharge point (60) is located between the towers (100, 101, 103, 104).

49. Machining station according to claim 1, **characterised in that** the machining unit (3) has conveying means (62) for the movement of the workpiece (2), respectively the workpiece carrier (5) on the conveying line (6), at least in the region of the machining station (1), and that the machining station (1) has two towers (100, 101) for the movement of the workpiece (2), that each tower carries a movable workpiece carriage and that the workpiece carriages, if necessary together, carry at least one workpiece, and that the conveying means (62) is located between the towers (100, 101).

50. Machining station according to claim 1, **characterised in that** the machining station (1) has two towers (100, 101) for the movement of the workpiece (2), each tower carries a movable workpiece carriage and the workpiece carriages, if necessary together, carry at least one

workpiece and the tool spindle (30) is arranged between the towers (103, 104).

51. Machining station according to claim 1, **characterised in that** the machining station (1) has two towers (100, 101) for the movement of the workpiece (2), each tower carries a movable workpiece carriage and the workpiece carriages, if necessary together, carry at least one workpiece and a workpiece (2) or a workpiece carrier (5) carrying the workpiece (2) is moved by at least one workpiece carriage (4) or both workpiece carriages (4, 4') of the two towers (100, 101, 103, 104).
52. Machining station according to claim 1, **characterised in that** the machining station (1) has two towers (100, 101) for the movement of the workpiece (2), each tower carries a movable workpiece carriage and the workpiece carriages, if necessary together, carry at least one workpiece and the towers (100, 101) are connected in their upper region (102).
53. Machining station according to claim 1, **characterised in that** the machining station (1) has two towers (100, 101) for the movement of the workpiece (2), each tower carries a movable workpiece carriage and the towers, if necessary together, carry at least one workpiece and each tower (100, 101, 103, 104) has a drive for the workpiece carriage (4, 4').
54. Machining station according to claim 1, **characterised in that** the machining station (1) has two towers (100, 101) for the movement of the workpiece (2), each tower carries a movable workpiece carriage and the workpiece carriages, if necessary together, carry at least one workpiece and each tower (100, 101, 103, 104) has a drive for the workpiece carriage (4, 4') and the workpiece carriage drives of the two towers (100, 101, 103, 104) are synchronised to each other.
55. Machining station according to claim 1, **characterised in that** the machining station (1) has two towers (100, 101) for the movement of the workpiece (2), each tower carries a movable workpiece carriage and the workpiece carriages, if necessary together, carry at least one workpiece and the workpiece carriages (4, 4') of both towers (100, 101, 103, 104) have a common rotational axis (A).
56. Machining station according to claim 1, **characterised in that** the machining station (1) has two towers (100, 101) for the movement of the workpiece (2), each tower carries a movable workpiece carriage and the workpiece carriages, if necessary together, carry at least one

workpiece and the workpiece carriages (4, 4<sup>1</sup>) each have a rotating drive for a common rotational axis (A) and these rotational drives can be synchronised to each other.

57. Machining station according to claim 1, **characterised in that** the workpiece carriage (4, 4<sup>1</sup>) for the workpiece (2) has a rotational drive for a rotational axis (B) which is orientated parallel to the direction of movement (Y) of the workpiece carriage (4, 4<sup>1</sup>).
58. Machining station according to claim 1, **characterised in that** the machining station (1) has two towers (100, 101) for the movement of the workpiece (2), each tower carries a movable workpiece carriage and the workpiece carriages, if necessary together, carry at least one workpiece and the workpiece carriages (4, 4<sup>1</sup>) of both towers (100, 101, 103, 104) can be connected by means of a bridge (48), the bridge (48) being able to rotate the at least one workpiece (2) around at least one rotational axis (B) parallel to the direction of movement of the workpiece carriages (4, 4<sup>1</sup>), if necessary also independently to each other.
59. Machining station according to claim 1, **characterised in that** the machining unit (3) has conveying means (62) for the movement of the workpiece (2), respectively the workpiece carrier (5), on the conveying line (6) at least in the region of the machining station (1), and the conveying means (62) carries out the feeding as well as the removing of the unfinished, respectively machined, workpieces (2).
60. Machining station according to claim 1, **characterised in that** the machining unit (3) has conveying means (62) for the movement of the workpiece (2), respectively the workpiece carrier (5), on the conveying line (6) at least in the region of the machining station (1) and the conveying means (62) has a means for feeding and removing (600), the unfinished workpieces (2) being fed on the means of feeding (601) and the machined workpieces (2) being conveyed away on the means for removing (600).
61. Machining station according to claim 1, **characterised in that** the machining unit (3) has conveying means (62) for the movement of the workpiece (2), respectively the workpiece carrier (5), on the conveying line (6) at least in the region of the machining station (1) and the conveying means (62) has a means for feeding and removing (600), the unfinished workpieces (2) being fed on the means for feeding (601) and the machined

workpieces (2) being conveyed away on the means for removing (600) and the means for feeding (601) and the means for removing (600) being arranged one above the other or next to each other.

62. Machining station according to claim 1, **characterised in that** two or more workpieces (2) are clamped on a workpiece carrier (5).
63. Machining station according to claim 1, **characterised in that** the workpieces (2) are arranged on the workpiece carrier (5) in longitudinal direction of the way of conveying or rectangular to that.
64. Machining station according to claim 1, **characterised in that** the machining station (1) has two or more tool spindles (30) and the machining station (1) machines simultaneously two or more workpieces (2).
65. Machining station according to claim 1, **characterised in that** several workpieces (2) are moved, respectively rotated, by one or more workpiece carriages (4, 4') in the same way or at least partly differently.
66. Machining station according to claim 1, **characterised in that** the spindle axis (31) of the tool spindle (30) is orientated parallel or rectangular to the direction of transport of the workpiece (2) on the conveying way.
67. Machining installation, in particular transfer line, comprising at least one or more machining stations according to claim 1, all machining stations being provided with a conveying line (6) for feeding and removing the workpiece (2).
68. Machining installation according to claim 67, **characterised in that** two or more machining stations are provided one behind the other and fed workpieces are conveyed through a first machining station to a free machining station.
69. Machining installation according to claim 67, **characterised in that** each workpiece, respectively each workpiece carrier, carries an identification element which also can be written on, if necessary.
70. Machining installation according to claim 67, **characterised in that** the machining stations are arranged one behind the other and the line for removing of the first machining station is the feeding line for the second machining station.

71. Machining installation according to claim 67, **characterised in that** several machining stations are arranged between a feeding line and a line for removing which are common for the machining station.
72. Machining installation according to claim 67, **characterised in that** the machining stations are arranged one behind the other and the removing line of the first machining station is the feeding line for the second machining station and that there is a connecting station from the removing line to the feeding line, and already machined workpieces are again fed for machining on the feeding line.
73. Machining installation according to claim 67, **characterised in that** the machining stations are arranged parallel and/or serial to each other and are connected by a conveying line.
74. Machining installation according to claim 67, **characterised in that** for conveying the workpieces at least two conveying lines are provided which are arranged essentially parallel to each other, next to each other or one above the other.
75. Method for positioning a workpiece on a machining unit, in particular a tool spindle carrying a tool, the workpiece being conveyed on a conveying line to the discharge point, picked up there by a workpiece carriage, in particular lifted, and the workpiece carriage conveying the workpiece to the machining unit and/or the workpiece carriage moving the workpiece during machining through the machining unit and the workpiece after finishing the machining being put down again by the workpiece carriage on the discharge point and after that the workpiece being removed on the conveying line, the workpiece being moved along only one linear axis by the workpiece carriage.
76. Method according to claim 75, **characterised in that** the workpiece carriage is lifted for the removing of the workpiece.
77. Method according to claim 75, **characterised in that** the workpiece carriage only then drives to the discharge point when the workpiece has been fed.